Does This Patient Have a Severe Upper Gastrointestinal Bleed?

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CLINICAL SCENARIO

Case 1

A 62-year-old man presents to the emergency department after an episode of syncope following several weeks of fatigue. He has a history of upper gastrointestinal bleeding (UGIB) due to peptic ulcer disease. His blood pressure is 90/60 mm Hg, pulse of 105/min, and a black, foul-smelling stool is found upon rectal examination. Blood test results show a hemoglobin level of 6.5 g/dL, a creatinine level of 1.0 mg/dL, and a serum urea nitrogen level of 55 mg/dL. Would the results of a nasogastric lavage help determine between an upper endoscopy or a colonoscopy as the test most likely to identify the bleeding source?

Case 2

A 45-year-old woman presents with 24 hours of diarrhea, nausea, and 2 episodes of vomiting coffee ground material. She takes no prescription medications other than those for hypertension and she takes no over-the-counter medications. Physical examination reveals blood pressure of 145/100 mm Hg, pulse of 70/min, and rectal examination with liquid brown stool. Blood test results reveal a hemoglobin level of 13.7 g/dL, a creatinine level of 1.1

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Context Emergency physicians must determine both the location and the severity of acute gastrointestinal bleeding (GIB) to optimize the diagnostic and therapeutic approaches.

Objectives To identify the historical features, symptoms, signs, bedside maneuvers, and basic laboratory test results that distinguish acute upper GIB (UGIB) from acute lower GIB (LGIB) and to risk stratify those patients with a UGIB least likely to have severe bleeding that necessitates an urgent intervention.

Data Sources A structured search of MEDLINE (1966-September 2011) and reference lists from retrieved articles, review articles, and physical examination textbooks.

Study Selection High-quality studies were included of adult patients who were either admitted with GIB or evaluated in emergency departments with bedside evaluations and/or routine laboratory tests, and studies that did not include endoscopic findings in prediction models. The initial search yielded 2628 citations, of which 8 were retained that tested methods of identifying a UGIB and 18 that identified methods of determining the severity of UGIB.

Data Extraction One author abstracted the data (prevalence, sensitivity, specificity, and likelihood ratios [LRs]) and assessed methodological quality, with confirmation by another author. Data were combined using random effects measures.

Data Synthesis The majority of patients (N=1776) had an acute UGIB (prevalence, 63%; 95% CI, 51%-73%). Several clinical factors increase the likelihood that a patient has a UGIB, including a patient-reported history of melena (LR range, 5.1-5.9), melenic stool on examination (LR, 25; 95% CI, 4-174), a nasogastric lavage with blood or coffee grounds (LR, 9.6; 95% CI, 4.0-23.0), and a serum urea nitrogen:creatinine ratio of more than 30 (summary LR, 7.5; 95% CI, 2.8-12.0). Conversely, the presence of blood clots in stool (LR, 0.05; 95% CI, 0.01-0.38) decreases the likelihood of a UGIB. Of the patients clinically diagnosed with acute UGIB, 36% (95% CI, 29%-44%) had severe bleeding. A nasogastric lavage with red blood (summary LR, 3.1; 95% CI, 1.2-14.0), tachycardia (LR, 4.9; 95% CI, 3.2-7.6), or a hemoglobin level of less than 8 g/dL (LR range, 4.5-6.2) increase the likelihood of a severe UGIB requiring urgent intervention. A Blatchford score of 0 (summary LR, 0.02; 95% CI, 0-0.05) decreases the likelihood that a UGIB requires urgent intervention.

Conclusions Melena, nasogastric lavage with blood or coffee grounds, or serum urea nitrogen:creatinine ratio of more than 30 increase the likelihood of a UGIB. Blood clots in the stool make a UGIB much less likely. The Blatchford clinical prediction score, which does not require nasogastric lavage, is very efficient for identifying patients who do not require urgent intervention.

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mg/dL, and a serum urea nitrogen level of 12 mg/dL. A nasogastric lavage has clear fluid. What is the probability that this patient is having a severe UGIB?

WHY ARE THESE QUESTIONS IMPORTANT?

In the United States, an estimated 390 000 hospitalizations annually occur with a principal diagnosis of gastrointestinal bleeding (GIB) and an additional 600 000 hospitalizations occur with a secondary diagnosis of GIB.[1] Some patients will have severe bleeding and require urgent intervention to reduce the potential for morbidity and mortality; however, many patients with minor bleeding can be managed effectively by arranging an endoscopy in the outpatient setting, which can spare the patient an urgent intervention and hospitalization.[2] Urgent interventions for the patient with severe bleeding include endoscopic therapy, blood transfusion, radiological intervention, or surgery. Patients hospitalized with a UGIB have a mortality of 4.5% to 8.2%,[3-5] and similar patients with a lower GIB (LGIB) have a mortality of 3.0% to 8.8%.[4,6,7]

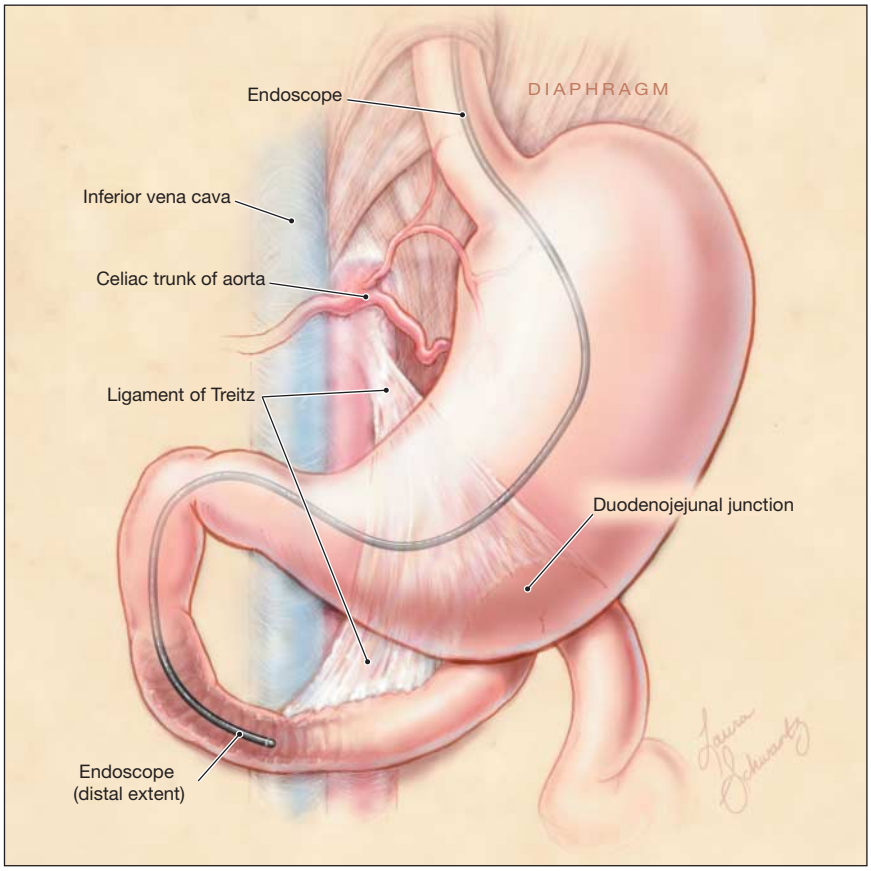
Identification of a UGIB (proximal to the ligament of Treitz) vs LGIB (distal to the ligament of Treitz) is critical to performing an effective, efficient evaluation and may be difficult even for an experienced clinician (FIGURE 1). In 1 study,[8] more than a third of patients without hematemesis presenting with an acute GIB underwent diagnostic testing of both the upper and lower gastrointestinal tract. Although all patients with GIB require assessment of hemodynamics and blood cell count, the remaining evaluations and potential interventions for a UGIB and LGIB differ considerably. For example, evaluation of a likely LGIB will include colonoscopy, flexible sigmoidoscopy, tagged red blood cell scan, or an angiogram. Conversely, if a patient has a likely UGIB, the first diagnostic study is typically an upper endoscopy. Additionally, certain medical therapies such as proton pump inhibitors and octreotide would only be appropriate for a UGIB. Once the location of the GIB is determined to be from an upper source, management will reflect the likelihood of severe bleeding. We conducted a systematic review to determine the accuracy of historical features, symptoms, signs, and combinations of findings that might help assess patients with GIB.

VISUAL EVIDENCE OF GIB

Melena

Although patients will recognize hematemesis or hematochezia, they may not appreciate and therefore may not report the passage of black, tarry stools that characterize melena. However, not all dark stools are melenic. Iron- or bismuth-containing medications can produce dark stools that mimic the appearance of true melena.[9] Melena suggests a proximal bleeding source in which there is more time for enzymatic breakdown to transform blood to melena and produce the characteristic pungent odor that an experienced practitioner can often identify immediately. In clinical experiments, placing as little as 50 mL of blood in the stomach can cause melena.[10] Although gastric acid may play a role in its formation, blood inserted into the small bowel or cecum can still create melenic stool. Melena appears to depend primarily on the length of time between installation of the blood and the patient having a bowel movement.[11,12] For example, 1 L of blood placed in the stomach can result in bright red blood per rectum within 4 hours, which implies that red blood or clots per rectum are due to either a very rapid blood loss or a distal source of bleeding.[10,13]

Figure 1. Anatomical Landmarks and Location of Gastrointestinal Bleeding



Bleeding sources proximal to the duodenojejunal junction, as approximated by the ligament of Treitz, are considered upper gastrointestinal bleeds.

Gastric Contents

Nasogastric lavage provides a method for sampling contents from the stomach. Although the routine use of nasogastric lavage in patients with suspected GIB remains controversial,[14,15] it is frequently used in the United States and Canada. A study performed in Los Angeles revealed that 60% (n=632) of patients underwent nasogastric lavage for UGIB,[16] and 28% (n=1869) of patients underwent the procedure in a study from Canada.[17] A recent survey of gastroenterologists' opinions about the role of nasogastric lavage for UGIB showed they were uncertain of its appropriateness (quantified with the RAND appropriateness scale) and also showed "extreme variation" (quantified with a disagreement index) in their opinions about its role.[18] Some clinicians consider the presence of varices a relative contraindication for the use of nasogastric lavage. However, there are no published trials to suggest that nasogastric lavage worsens bleeding[19] in patients with or without varices.

Once a nasogastric tube has been properly inserted (FIGURE 2), a minimum of 100 to 200 mL of room temperature water or normal saline is inserted via the tube into the stomach and then aspirated to evaluate the color of return. Bright red blood indicates fresh blood. Aspirate that looks like wet coffee grounds indicates blood that has been partially degraded.[13,15,20] Many clinicians infer that yellow-green tinge indicates bile from contents beyond the pylorus, but visual determination of bile may not be accurate.[21]

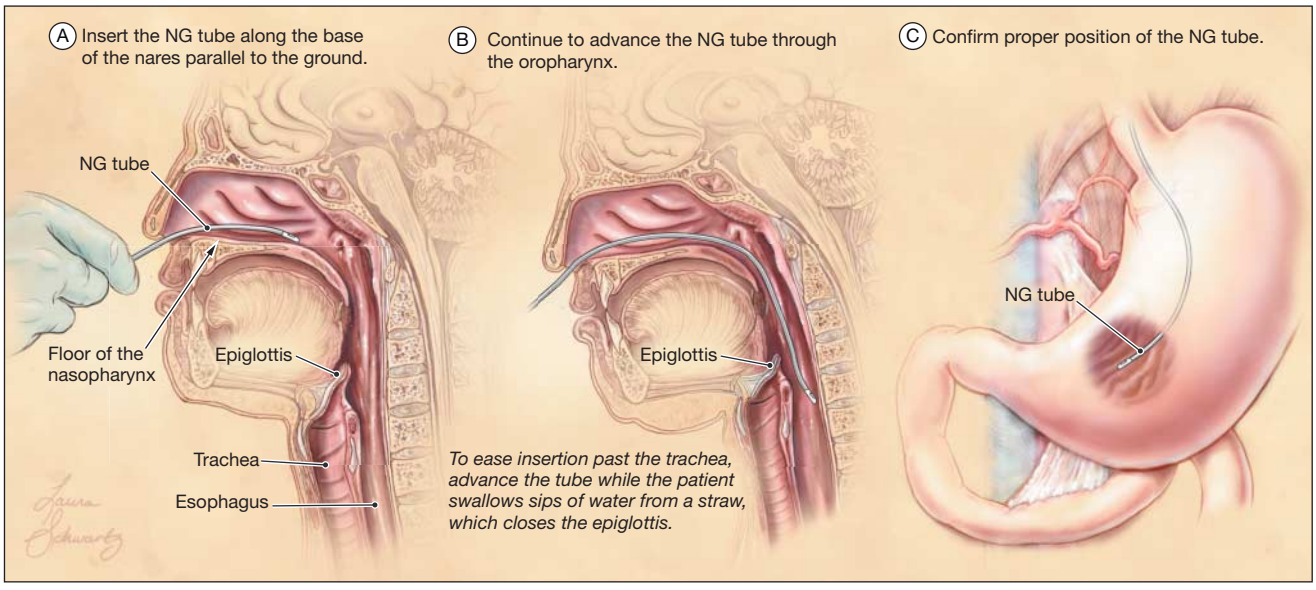
METHODS

Search Strategy and Study Selection

We searched MEDLINE (1966-September 2011) for articles on the reliability and diagnostic accuracy for components of the clinical examination and routine investigations for distinguishing acute UGIB from LGIB and for determining the severity of a UGIB. Our strategy was intentionally broad to minimize the chance of overlooking a relevant article. We defined acute by the setting (defined as patients having presented to an emergency department for assessment of GIB, patients being admitted to the hospital for GIB, or both). We defined a severe UGIB as one with either high-risk endoscopic stigmata because intervention is recommended[22] or if an intervention was performed, including endoscopic therapy, blood transfusion, radiological intervention, or surgery. Previous studies have used similar definitions as any of the above outcomes would necessitate an immediate intervention by the clinician.[2,23]

The search was conducted using a similar strategy developed for the Rational Clinical Examination series (eMethods, http://www.jama.com). We included studies that evaluated the diagnostic accuracy or reliability of some element of the history, physical examination, bedside maneuvers (nasogastric lavage), or routine investigations (defined as complete blood cell count, electrolytes, creatinine level, serum urea nitrogen level, prothrombin time, partial thromboplastin time, bilirubin, transaminases, alkaline phosphatase) for determining either the presence of a UGIB in a patient presenting with a

Figure 2. Key Steps in Nasogastric (NG) Tube Insertion



Prior to insertion of the NG tube, inspect the nares to confirm the absence of any obstruction. If the nares are symmetrical, insert the tube in the side with the larger passageway. Most experts suggest applying topical lidocaine in the nares for patient comfort during insertion. A, With the patient seated and head level, insert the first 10 cm of a lubricated NG tube along the floor of the nasopharynx (parallel to the ground). B, Advance the tube through the oropharynx past the epiglottis and trachea into the esophagus and stomach. C, Confirm proper location of the NG tube by aspiration for stomach contents, auscultation over the stomach after pushing air through the tube with a syringe, or by an abdominal radiograph.

clinically apparent GIB or for determining the need for an urgent evaluation of a patient presenting with a UGIB. To convert creatinine level to micromoles per liter, multiply by 88.4; and serum urea nitrogen level to millimoles per liter, multiply by 0.357.

Statistical Analysis

For each study, we calculated the prevalence, sensitivity, specificity, likelihood ratios (LRs), and 95% CIs from 2×2 tables (for studies with a 0 cell value, 0.5 was added to each cell to calculate the LR CI). When possible, we reanalyzed the reported results from individual studies that allowed us to estimate the stratum-specific LR (serial LR) for increasing levels of abnormality from scoring systems. Findings that were evaluated in only 2 studies are summarized with ranges and those findings in only 3 studies were summarized with univariate random effects measures (Comprehensive Meta-analysis, version 2.2.057; Biostat). We attempted to use bivariate random effects for findings reported in 4 or more studies, but when results did not converge on a solution we used univariate measures.[24,25] Heterogeneity for findings reported in 3 or more studies was assessed with a derSimonian-Laird procedure using Comprehensive Meta-analysis.[26]

RESULTS

Search Results

A total of 2628 citations were identified in our literature search. Of these, 2516 were excluded after review of their abstracts and titles. The remaining studies (n=112) were reviewed in detail, with 25 studies meeting inclusion criteria (eMethods, eFigure, eTable 1, and eTable 2).

Prevalence of UGIB Hemorrhage

A summary prevalence of 8 studies[8,27-33] in our review that differentiated UGIB from LGIB found that 63% (95% CI, 51%-73%) of patients presenting with gastrointestinal hemorrhage have an upper gastrointestinal source. A summary prevalence from 8 prospective studies of severity of UGIB included in our review showed that 36% (95% CI, 29%-44%) of patients who present with a UGIB require immediate intervention (blood transfusion, urgent endoscopic therapy, radiological intervention, or surgery).

Accuracy of Findings That Distinguish UGIB From LGIB

The factors of the history, physical examination, and basic laboratory test results with positive LR of 2.0 or more or negative LR of 0.5 or less that discriminate UGIB from LGIB are shown in TABLE 1 (eTable 3 includes complete data for other findings with less useful LR and eTable 4 includes results of individual studies presented as summary measures).[8,27-33]

Historical Factors. Patients with a UGIB are much more likely to have had a prior history of UGIB (LR, 6.2; 95% CI, 2.8-14.0). Conversely, a prior history of an LGIB makes an upper source less likely (LR, 0.17; 95% CI, 0.09-0.35). Patients with UGIB are more likely to be younger than 50 years (LR, 3.5; 95% CI, 2.0-6.1). Although warfarin use was twice as likely in patients with a UGIB rather than an LGIB (LR, 2.3; 95% CI, 1.1-5.0), all other historical features with an LR of more than 2 had a CI that included 1. The use of nonsteroidal anti-inflammatory drugs, aspirin, and alcohol had LRs approaching 1 and could not differentiate between UGIB and LGIB (eTable 3).

Symptoms. A history of passing black stool (LR range, 5.1-5.9) or tarry stool

Table 1. Clinical Factors of the Bleeding Location for the Evaluation of UGIB From the History and Clinical Examination With Positive LR of ≥2.0 or Negative LR of ≤0.5

Clinical Factors	Sensitivity, % (95% CI)	Specificity, % (95% CI)	Positive LR (95% CI)	Negative LR (95% CI)
Demographic and historical features				
Prior history of UGIB[8]	22 (18-25)	96 (94-98)	6.2 (2.8-14.0)	0.81 (0.74-0.89)
Age <50 y[8]	27 (22-31)	92 (89-95)	3.5 (2.0-6.1)	0.80 (0.71-0.89)
Cirrhosis[8]	5 (3-6)	99 (97-99.4)	3.1 (0.78-12.0)	0.97 (0.93-1.00)
Warfarin use[8]	12 (8-15)	95 (93-97)	2.3 (1.1-5.0)	0.93 (0.87-1.00)
Iron use[8]	6 (3-8)	98 (96-99)	2.2 (0.7-6.6)	0.97 (0.93-1.00)
History of LGIB[8]	6 (3-11)	64 (62-67)	0.17 (0.09-0.35)	1.5 (1.3-1.6)
Symptoms				
Black stool history (melena)[8,27,a]	77-95	81-87	5.1-5.9	0.06-0.27
Epigastric pain[8]	17 (12-21)	93 (90-95)	2.3 (1.2-4.4)	0.90 (0.82-0.98)
Signs				
Melenic stool on examination[27]	49 (45-50)	98 (91-99.6)	25 (4-174)	0.52 (0.42-0.64)
Nasogastric lavage with blood or coffee grounds[28]	44 (39-48)	95 (90-98)	9.6 (4.0-23.0)	0.58 (0.49-0.70)
Clots in stool[8]	15 (14-15)	99.2 (96.0-99.9)	0.05 (0.01-0.38)	1.2 (1.1-1.2)
Laboratory findings				
Serum urea nitrogen: creatinine ratio >30[8,29-33,b]	51 (26 to 75)	93 (87 to 99)	7.5 (2.8-12.0)	0.53 (0.28-0.78)
Hematocrit, %[8,c]				
≤20	NA	NA	2.6 (1.4-4.6)	
21-29	NA	NA	1.9 (1.4-2.5)	
30-39	NA	NA	0.46 (0.32-0.65)	
≥40	NA	NA	0.26 (0.10-0.67)	

Abbreviations: LGIB, lower gastrointestinal bleeding; LR, likelihood ratio; NA, not applicable; UGIB, upper gastrointestinal bleeding.

[a] Summary estimate provided as a range because the finding was evaluated in only 2 studies.

[b] Summary estimates calculated with bivariate random effects. For serum urea nitrogen:creatinine ratio of more than 30, the positive LR test for homogeneity, I^2=17%; P=.31; and the negative LR test for homogeneity, I^2=94%; P<.001.

[c] Serial LR (95% CI) is a multilevel LR that can be used to give LR for each different threshold as opposed to choosing a single cutoff and then giving a dichotomous LR.

makes a UGIB much more likely. Epigastric discomfort also favors a UGIB (LR, 2.3; 95% CI, 1.2-4.4).

Signs. The physician's examination finding of melena (either observed as a passed stool or stool obtained via rectal examination) was the most useful finding for identifying a UGIB (LR, 25; 95% CI, 4-174). In patients without a history of hematemesis, nasogastric lavage with clear evidence of blood in the aspirate (blood or coffee grounds grossly present) suggests a UGIB with an LR of 9.6 (95% CI, 4.0-23.0).

The presence of clots in the stool makes a UGIB much less likely (LR, 0.05; 95% CI, 0.01-0.38). Nasogastric lavage without evidence of blood in the aspirate (no blood or coffee grounds grossly present) makes a UGIB less likely (LR, 0.58; 95% CI, 0.49-0.70).

Laboratory Findings. An increased serum urea nitrogen:creatinine ratio suggests a UGIB. Although several different thresholds have been evaluated, combining all results in which the serum urea nitrogen:creatinine ratio is more than 30 results in a homogeneous diagnostic odds ratio (I^2=17%, P=.31), with a summary LR of 7.5 (95% CI, 2.8-12.0). Serum urea nitrogen:creatinine ratios of 30 or less decrease the odds of a UGIB with a summary LR of 0.53 (95% CI, 0.28-0.78), although there is heterogeneity in the results (I^2=94%, P<.001).

Increasing severity of anemia increases the likelihood of UGIB. Patients with severe anemia (hematocrit ≤20%) are more likely to have a UGIB (LR, 2.6; 95% CI, 1.4-4.6), but those with no anemia are less likely to have a UGIB (hematocrit ≥40%; LR, 0.26; 95% CI, 0.10-0.67).

Table 2. Clinical Factors of Severity of Bleeding From the History and Clinical Examination Used to Determine the Need for Urgent Evaluation of UGIB With Positive LR of ≥2.0 or Negative LR of ≤0.5[a]

Clinical Factors	Sensitivity, % (95% CI)	Specificity, % (95% CI)	Positive LR (95% CI)	Negative LR (95% CI)
Demographic and historical features				
History of malignancy or cirrhosis[34]	22 (14-28)	94 (92-96)	3.7 (1.6-8.8)	0.83 (0.72-0.97)
Cirrhosis[35]	15 (12-18)	95 (94-97)	3.2 (2.1-4.9)	0.89 (0.85-0.94)
Syncope[35]	8 (6-10)	98 (97-98)	3.0 (1.7-5.4)	0.95 (0.91-0.98)
Analgesic use[36]	13 (8-19)	95 (94-96)	2.6 (1.3-5.2)	0.92 (0.84-0.99)
Coffee ground vomiting[35]	7 (4-10)	83 (82-84)	0.41 (0.26-0.64)	1.1 (1.1-1.2)
Hematochezia[35]	2 (1-4)	92 (91-93)	0.22 (0.09-0.53)	1.1 (1.0-1.1)
Signs				
Pulse rate >100/min[34]	71 (60-79)	86 (82-89)	4.9 (3.2-7.6)	0.34 (0.22-0.53)
Nasogastric lavage, red blood[16,17,21,34,b]	77 (57-90)	76 (32-95)	3.1 (1.2-14.0)	0.32 (0.17-0.57)
Shock[17,34,c,d]	78 (56-90)	71 (46-88)	2.8 (1.1-7.2)	0.32 (0.10-0.96)
Nasogastric lavage, red blood or coffee grounds[17,21,28,c]	81 (67-89)	55 (19-87)	2.0 (1.0-4.0)	0.40 (0.20-0.81)
Hypotension[34,36,e]	55-59	53-89	1.2-4.8	0.51-0.78
Laboratory findings				
Hemoglobin level <8 g/dL[34,e]	65-68	86-89	4.5-6.2	0.36-0.41
Serum urea nitrogen level >90 mg/dL[34]	63 (52-72)	83 (79-86)	3.6 (2.4-5.5)	0.45 (0.31-0.65)
White blood cell count >12 x10^9/L[34]	61 (50-71)	82 (78-86)	3.4 (2.2-5.1)	0.48 (0.34-0.68)

Abbreviations: LR, likelihood ratio; UGIB, upper gastrointestinal bleeding.
SI conversion: To convert serum urea nitrogen level to mmol/L, multiply by 0.357.
[a] Summary ranges and LR are presented for factors evaluated in multiple studies.
[b] Heterogeneity for bivariate random effects (positive LR, I^2=90%; P<.001; negative LR, I^2=81%; P<.001).
[c] Heterogeneity for univariate random effects (shock: positive LR, I^2=96%; P<.001; negative LR, I^2=91%; P<.001; red blood or coffee grounds: positive LR, I^2=95%; P<.001; negative LR, I^2=67%; P=.047).
[d] Systolic blood pressure of less than 100 mm Hg or pulse of more than 100/min or orthostatic decrease in systolic blood pressure by more than 10% or orthostatic increase in pulse of more than 10% between sitting and supine position.
[e] Range given because finding evaluated in only 2 studies.

Accuracy of Factors to Identify Need for Urgent Evaluation of UGIB

In patients presenting with symptoms of UGIB, the factors obtained from the history, physical examination, and basic laboratory test results predictive of a severe UGIB with a positive LR of 2.0 or more or a negative LR of 0.5 or less are shown in TABLE 2 (eTable 5 includes complete data for other findings with less useful LR and eTable 6 includes results of individual studies presented as summary measures) and TABLE 3. Single-study clinical prediction rules are shown in eTable 7.

Historical Factors, Symptoms, and Signs. Once a patient is identified as having a UGIB, patients with history of cirrhosis or malignancy (LR, 3.7; 95% CI, 1.6-8.8), syncope (LR, 3.0; 95% CI, 1.7-5.4), or those using analgesics (LR, 2.6; 95% CI, 1.3-5.2) are more likely to have severe bleeding. The importance of analgesic use requires confirmation because the use of nonsteroidal anti-inflammatory drugs (LR, 1.8; 95% CI, 1.2-2.6) was less important for identifying patients with severe bleeding (eTable 5).

The clinical use of the nasogastric lavage depends on the color of the returned fluid. The highest likelihood of a severe UGIB is with an aspirate of red blood (summary LR, 3.1; 95% CI, 1.2-14.0). A similar result was found in studies that considered either red blood or coffee grounds as positive for UGIB (summary LR, 2.0; 95% CI, 1.0-4.0). A nasogastric lavage without bright red blood (summary LR, 0.32; 95% CI, 0.17-0.57) makes severe bleeding less likely. As opposed to visible blood, the presence of occult blood is not diagnostic of UGIB needing urgent intervention, and the absence of occult blood has a broad CI and thus its use is uncertain (eTable 5).

Hemodynamic signs associated with volume loss, such as tachycardia (LR, 4.9; 95% CI, 3.2-7.6), shock (summary LR, 2.8; 95% CI, 1.1-7.2), and hypotension

(LR range, 1.2-4.8), may be helpful for identifying patients with severe UGIB, but have broad CIs. The absence of tachycardia (LR, 0.34; 95% CI, 0.22-0.53) was the most useful sign for decreasing the likelihood of severe UGIB.

Laboratory Findings. A hemoglobin level of less than 8 g/dL (LR range, 4.5-6.2), a serum urea nitrogen level of more than 90 mg/dL (LR, 3.6; 95% CI, 2.4-5.5), or a white blood cell count of more than 12×10^9/L (LR, 3.4; 95% CI, 2.2-5.1) increase the likelihood of severe UGIB. A hemoglobin level of 8 g/dL or higher (LR range, 0.36-0.41), a serum urea nitrogen level of 90 mg/dL or less (LR, 0.45; 95% CI, 0.31-0.65), and a white blood cell count of 12×10^9/L or less (LR, 0.48; 95% CI, 0.34-0.68) decrease the likelihood of severe UGIB.

Clinical Prediction Models. Combinations of findings have been evaluated to better guide clinical decision making (TABLE 4) (eTable 8, eTable 9, eTable 10, and eTable 11 include detailed descriptions of the algorithms). The Blatchford score[23] (Table 4) has the most extensive validation and the best accuracy for identifying patients who present with UGIB who do not need urgent intervention (Table 3). A Blatchford score of 0 occurs in up to 22% of patients with UGIB[2,23] and identifies patients with a low likelihood of severe bleeding (summary LR, 0.02; 95% CI, 0-0.05). Blatchford scores at a threshold of 2 or less perform similarly, although the CI is broader (summary LR, 0.08; 95% CI, 0.01-0.41). The components of the full Rockall score that can be obtained before endoscopy produce the preendoscopic Rockall score. A preendoscopic Rockall score of more than 0 does not increase the likelihood of severe bleeding (summary LR, 1.20; 95% CI, 0.97-1.30), but a score equal to 0 decreases the likelihood of severe bleeding (summary LR, 0.41; 95% CI, 0.12-0.70) (Table 3).

Table 3. Well-Validated Clinical Prediction Rules Used to Determine the Need for Urgent Evaluation of UGIB

Clinical Score	Threshold	Sensitivity, % (95% CI)	Specificity, % (95% CI)	Positive LR (95% CI)	Negative LR (95% CI)
Blatchford score[37-39]	≤2[a]	98 (92-99)	27 (11-53)	1.4 (1.1-1.8)	0.08 (0.01-0.41)
Blatchford score[2,23,35,37-41]	0[b]	99.6 (99.0-100.0)	15 (5-25)	1.2 (1.0-1.3)	0.02 (0-0.05)
Preendoscopic Rockall score[2,38,40-42]	0[c]	91 (88-95)	21 (9-34)	1.20 (0.97-1.30)	0.41 (0.12-0.70)
Modified Blatchford score[43]	≤1	95 (93-96)	12 (11-13)	1.1 (1.0-1.1)	0.45 (0.31-0.66)

Abbreviations: LR, likelihood ratio; UGIB, upper gastrointestinal bleeding.
[a] Heterogeneity for univariate random effects (positive LR, I^2=86%; P<.001; negative LR, I^2=45%; P=.16).
[b] Because sensitivity was 99% to 100% in every study, sensitivity was treated as a fixed effect. Heterogeneity (positive LR, I^2=97%; P<.001; negative LR, I^2=0%; P=.59).
[c] Heterogeneity (positive LR, I^2=92%; P<.001; negative LR, I^2=70%; P<.001).

Table 4. The Blatchford Score[23]

Variable	Score
Serum urea nitrogen, mg/dL	
<18.2	0
18.2-<22.4	2
22.4-<28.0	3
28.0-<70.0	4
≥70.0	6
Hemoglobin for men, g/dL	
>13.0	0
12.0-<13.0	1
10.0-<12.0	3
<10.0	6
Hemoglobin for women, g/dL	
>12.0	0
10.0-<12.0	1
<10.0	6
Systolic blood pressure, mm Hg	
>109	0
100-109	1
90-99	2
<90	3
Pulse rate >100/min	1
Presentation with melena	1
Presentation with syncope	2
Hepatic disease	2
Cardiac failure	2

SI conversion: To convert serum urea nitrogen to mmol/L, multiply by 0.357.

COMMENT

Our review and meta-analysis have limitations inherent in the particular study questions. The reference standard for a study that seeks to establish a definitive location of a GIB is problematic. Often, a patient may have either no definitive source or multiple possible sources of a GIB. For example, a recent study of LGIB found that in patients who received standard care, only 22% had a definitive source of bleeding and only 76% had either a definitive or a presumptive source of bleeding.[44] Thus, all studies identifying factors associated with source of bleeding may be limited by ascertainment bias. Other limitations are due to the paucity of published investigations for certain predictive factors. For example, few data exist regarding the association of hematemesis and GIB location because presumably all patients with hematemesis have a UGIB. In accordance with the format and focus of the Rational Clinical Examination series, our review was designed to systematically examine the clinical factors that may assist only in the diagnosis of GIB. Our goal was to identify both the location of bleeding (ie, upper vs lower intestinal tract) and in those patients with UGIB the severity of bleeding as defined by those likely to require an intervention. The review does not, however, discuss the role and data for specific interventions to treat patients with UGIB.

Heterogeneity in results may come from differences in study populations (eg, severity of comorbid illnesses), local practice patterns (eg, admission rates for patients with UGIB), prevalence of different etiologies of UGIB, and even changing practice patterns over time. Both the diagnostic process and likely even underlying pathophysiology (in the proton pump inhibitor era) have changed dramatically in the last 25 years, leading to differences in results that may manifest as wide CIs for summary LRs. Heterogeneity may also arise

from differences in case definitions for bleeding source or severity. Despite these potential differences, we chose to combine studies whenever possible to provide an overall assessment of the usefulness of each clinical feature or predictive rule, while also providing accompanying CIs to allow the appropriate interpretation of the complete data.

Nasogastric aspiration has advantages as a diagnostic bedside maneuver to evaluate GIB due to its availability, low cost, and very low risk of complications.[45] Additional benefits include removal of excess fluid, blood, and clots, which may improve visualization and decrease the risk of aspiration if endoscopy is performed.[46] Generally patients with a positive result go on to upper endoscopy. However, patients with negative results may still require upper endoscopy instead of an examination for LGIB because the negative LR is insufficient to rule out a UGIB. Therefore, its role as a diagnostic test to differentiate UGIB and LGIB should be questioned.[14,15] Furthermore, nasogastric insertion is among the most uncomfortable bedside procedures in the emergency department and patients rate its discomfort comparable with fracture reduction or abscess drainage.[47]

Often the clinical challenge is not to identify the source of bleeding, but rather to assess the severity of a suspected UGIB. Although clinical situations such as suspicion of variceal bleeding in a patient with cirrhosis or of an aortoenteric fistula require urgent evaluation,[48,49] most situations are not as clear. Some gastroenterologists use the presence of bright red blood on nasogastric lavage as a criterion for performing endoscopy within 6 to 12 hours, although there is no clear evidence that rapid endoscopy provides clinical benefit in nonvariceal bleeding[50,51] and consensus guidelines only recommend that endoscopy be performed within 24 hours in patients with UGIB.[52] Although a nasogastric lavage with a bloody result has a significant LR that can further help "rule in" a UGIB requiring urgent endoscopy, seldom is a clinician encountered with a situation in which nasogastric lavage is used to "rule in" severe bleeding. Much more frequently, the physician is attempting to "rule out" a bleed requiring urgent intervention. Unfortunately, a negative nasogastric lavage has an LR that provides little or no assistance in "ruling out" severe bleeding and is unlikely to change the clinical determination for urgent endoscopy.

SCENARIO RESOLUTION

Case 1

This older man has multiple factors increasing the likelihood for an upper source of blood loss with a history of prior UGIB (LR, 6.2), melena (LR range, 5.1-5.9), low hemoglobin level (LR, 2.6), and an increased serum urea nitrogen:creatinine ratio (LR, 7.5). With a pretest probability of 63% for a UGIB, these findings increase the probability of a UGIB to at least 82%. Likewise, this patient has several factors that increase the likelihood of a severe UGIB with signs of tachycardia (LR, 4.9), low hemoglobin level (LR range, 4.5-6.2), and a Blatchford score of more than 1 (LR, 1.4). Based only on these factors, this patient should receive an urgent upper endoscopy either in the emergency department or as an inpatient, and a diagnostic nasogastric lavage is unnecessary to differentiate a UGIB from an LGIB.

Case 2

This woman has multiple factors that decrease the likelihood of a severe UGIB. She has no tachycardia (LR, 0.34), a normal hemoglobin level (range LR, 0.36-0.41), a clear nasogastric lavage (LR, 0.40), and a Blatchford score of 0 (LR, 0.02). Based on a pretest probability of 30% for a severe UGIB among all patients with gastrointestinal hemorrhage, the best individual finding lowers the likelihood of a severe hemorrhage to 13% or less. However, the combination of findings from the Blatchford score make a severe GIB unlikely (probability <1%) in this patient.

BOTTOM LINE

Gastrointestinal hemorrhage is the common pathway of myriad different pathophysiological processes. Inspection of the stool is the most important factor for identifying the bleeding source. Melenic stool on physical examination (LR, 25) provides compelling evidence for a UGIB, although red blood and clots are unlikely to come from a UGIB (LR, 0.05). Nasogastric lavage for blood or coffee grounds (LR, 9.6), a history of a prior UGIB (LR, 6.2), and a serum urea nitrogen:creatinine ratio of more than 30 (LR, 7.5) are other findings that suggest a UGIB.

Tachycardia (pulse rate of >100/min; LR, 4.9), a history of cirrhosis or malignancy (LR, 3.7), hemoglobin level of less than 8 g/dL (LR range, 4.5-6.2), or a nasogastric lavage with red blood (LR, 3.1) increase the likelihood of severe bleeding. All patients with a UGIB should have a Blatchford score, which does not require a nasogastric lavage, to help assess the severity (Blatchford score=0; LR, 0.02 for identifying patients requiring urgent evaluation). When negative, prediction rules combining symptoms, signs, and routine laboratory test results almost definitively rule out severe UGIB, thereby identifying at least some patients who can be safely evaluated as an outpatient.

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Study concept and design: Srygley, Fisher.
Acquisition of data: Srygley, Gerardo, Tran, Fisher.
Analysis and interpretation of data: Srygley, Gerardo, Fisher.
Drafting of the manuscript: Srygley.
Critical revision of the manuscript for important intellectual content: Srygley, Gerardo, Tran, Fisher.
Statistical analysis: Srygley.
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